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Part IX

Environmental Protection Agency

Standards for Performance for New Stationary Sources; Revisions to General Provisions and Additions to Appendix A, and Reproposal of Revisions to Appendix B

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

[AD-FRL 1625-7]

Standards of Performance for New Stationary Sources; Proposed Revisions to General Provisions and Additions to Appendix A, and Reproposal of Revisions to Appendix B

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed Rule and Notice of Public Hearing.

SUMMARY: This proposed rule (1) revises the monitoring requirements (§ 60.13) of the General Provisions, (2) adds Methods 6A and 6B to Appendix A, and (3) reproposes revisions to Performance Specifications 2 and 3 to Appendix B of 40 CFR Part 60. The proposed revisions to § 60.13 are being made to make this section consistent with the proposed revisions to Appendix B. Methods 6A and 6B are being proposed because they simplify the determination of the SO_2 emission rates in terms of ng/J. Performance Specifications 2 and 3 revisions are being reproposed because the changes that have been made to the performance specifications as a result of comments received on the original proposal of October 10, 1979 (44 FR 58602) are substantial and involve an entirely new concept.

DATES: *Comments.* Comments must be received on or before March 27, 1981.

Public Hearing. A public hearing will be held on February 19, 1981 beginning at 9 a.m.

Request to Speak at Hearings. Persons wishing to present oral testimony must contact EPA by February 12, 1981 (1 week before hearing).

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Central Docket Section (A-130), Attention: Docket Number OAQPS-79-4, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460.

Public Hearing. The public hearing will be held at Emission Measurement Labatory, R.T.P. North Carolina. Persons wishing to present oral testimony should notify Ms. Vivian Phares, Emission Measurement Branch (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5423.

Docket. Docket Number OAQPS-79-4 (Performance Specifications 2 and 3) and Docket Number A-80-30 (Methods 6A and 6B), containing supporting information used in developing the proposed rulemaking are located in the U.S. Enviromental Protection Agency, Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460. The docket may be inspected between 8 a.m. and 4 p.m. on weekdays, and a reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Mr. Roger T. Shigehara (MD-19), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-2237.

SUPPLEMENTARY INFORMATION: The discussion in this section has been divided into three separate parts. Part A discusses proposed changes to the General Provisions of 40 CFR Part 60, Part B discusses the addition of proposed Methods 6A and 6B to Appendix A, and Part C discusses reproposal of revisions to Performance Specifications 2 and 3 to Appendix B.

Part A

The proposed revisions to § 60.13 of the General Provisions are being made to make this section consistent with the proposed revisions to Appendix B. Since the reproposal to Appendix B uses the concept of evaluating the continuous emission monitors as a system, based on relative accuracy test results, the use of certified cylinder gases, optical filters, or gas cells is not necessary. The requirement for quantification of the zero and span drifts is not a change, but a clarification of what is required under the existing performance specifications.

Part B

Two reference methods (Methods 6A and 6B) are proposed. Method 6A, "Determination of Sulfur Dioxide, Moisture, and Carbon Dioxide Emissions from Fossil Fuel Combustion Sources," combines the sampling and analysis of SO_2 and CO_2. The SO_2 is collected in a hydrogen peroxide solution and analyzed by the barium-thorin titration procedure described in Method 6. The CO_2 is collected by a solid absorbent and analyzed gravimetrically. The sample gas volume is measured to allow determination of SO_2 concentration, CO_2 concentration, moisture, and emission rate from combustion sources in ng/J. If the only measurement needed is in terms of emission rate or if the CO_2 and moisture concentrations are not needed, e.g., to convert NO_x concentration to ng/J, the volume meter is not required. It is intended that Method 6A be used as an alternative to Methods 6 and 3 for the purpose of determining SO_2 emission rates in ng/J.

Method 6B, "Determination of Sulfur Dioxide and Carbon Dioxide Daily Average Emissions from Fossil Fuel Combustion Sources," employs the same sampling train and analysis procedures as Method 6A, but the operation of the train is controlled on an intermittent basis by a timer or on a continuous basis by using a low, constant flow-rate pump. This allows an extended sampling time period and the determination of an average value for that time period of SO_2 concentration, CO_2 concentration, and emission rate from combustion sources in ng/J. Method 6B is proposed as an acceptable procedure for compliance with § 60.47a (f) of 40 CFR Part 60, Subpart Da. This paragraph (f) requires that in the event of CEMS breakdown, emission data will be obtained by using other monitoring systems or reference methods approved by the Administrator.

Part C

Revisions to Performance Specifications 2 and 3 for the initial evaluation of continuous emission monitoring systems (CEMS) for SO_2, NO_x, and diluent gases were proposed on October 10, 1979 (44 FR 58602). Comments received as a result of this proposal led to reevaluation of the provisions and a change in the overall approach to the performance specifications. The reproposed performance specifications deemphasize instrument equipment specifications and add emphasis to the evaluation of the CEMS and its location as a system. The specification requirements are limited to calibration drift tests and relative accuracy tests. The acceptability limits for relative accuracy remain the same as in the previously proposed revisions to the performance specifications.

CEMS guidelines will also be published in a separate document at the time of proposal to provide vendors, purchasers, and operators of CEMS with supplementary equipment and performance specifications. The guidelines will contain additional procedures and specifications that may provide further evaluation of the CEMS beyond that required by Performance Specifications 2 and 3, e.g., response time, 2-hour zero and calibration drifts, sampling locations, and calibration value analyses.

Applicability

The proposed revisions would apply to all CEMS currently subject to Performance Specifications 2 and 3. These include sources subject to standards of performance that have

already been promulgated and sources subject to Appendix P to 40 CFR Part 51. Since the requirements of the reproposed performance specification revisions are limited to daily calibration drift tests and relative accuracy tests, existing CEMS that met the specifications of the current Performance Specifications 2 and 3 also meet the requirements of these revised specifications and, therefore, do not require retesting.

This reproposal has retained the definition of a "continuous emission monitoring system" and includes the diluent monitor, if applicable. This definition requires the relative accuracy of the CEMS to be determined in terms of the emission standard, e.g., mass per unit calorific value for fossil fuel-fired steam generators. Several commenters felt that the limits of relative accuracy should be relaxed from the present 20 percent because of the addition of the diluent analyzer output. Others added that errors with the manual reference methods could increase the possibility of poor relative accuracy determinations now that an additional measurement is required. The Administrator has reviewed a number of relative accuracy tests and has concluded that the variations in the manual reference method determinations are not the major cause of failure, but that the difference between the mean of the reference method and the CEMS values is the most probable cause. This situation is correctable.

Comments on Proposal

Numerous commenters noted that the proposed revisions go far beyond clarification and considered them as significant changes. A large part of this concern was because they felt that many existing CEMS were not installed according to the proposed installation specifications. In addition, many commenters felt the need for greater flexibility in selecting alternative CEMS measurement locations. Several commenters desired the inclusion of test procedures to evaluate single-pass, in situ CEMS. Others objected to the length and cost of testing. Opposing views were presented on the need for stratification checks. Many commenters dealt with specific parts of the proposal and a few raised issues beyond the scope of the revisions. Because the Administrator has changed the overall approach to performance specifications as mentioned in the beginning of Part C, many of these comments no longer apply and many of the objections have been resolved.

The quality assurance requirements for CEMS and associated issues were raised by many commenters. Most commenters stated that there was a need for EPA to issue guidelines or requirements for quality assurance. EPA is developing such procedures, and they will be published later this year or early next year as Appendix E to 40 CFR Part 60. Some commenters erroneously assumed that the quality assurance procedures were an integral part of the specifications. Although related, this specification should be evaluated on the basis of its adequacy in evaluating a CEMS after their initial installation.

The reproposed performance specifications include a provision that the relative accuracy of a CEMS must be within ±20 percent of the mean reference value or ±10 percent of the applicable standard, whichever is greater. Several commenters endorsed this change, while one felt the change to allow an accuracy of ±10 percent of the applicable standard is too lenient at low emission rates. The Administrator feels that it is restrictive to require a high degree of relative accuracy when the actual emission levels are equivalent to 50 percent or less of the applicable emission standard.

Request for Comments on Other Views

A number of suggestions were received which were not incorporated in these revisions. Because they represent differing views, EPA requests comments on them to determine what course of action should be taken in the final rule making. The suggestions are as follows:

1. Section 60.13(b) was revised to exclude the mandatory 7-day conditioning period used to verify the CEMS operational status. Once commenter feels that the mandatory conditioning period should not only be retained, but should be made longer depending on how the CEMS is used (i.e., for operation and maintenance requirements or for compliance/enforcement purposes) as follows:

a. The presently required 7-day conditioning period should be retained for CEMS used for operation and maintenance requirements.

b. If the CEMS is used for compliance/enforcement purposes, a 30-day conditioning period should be required and that the relative accuracy tests should be spread over 3 days instead of one.

c. All CEMS, whether for operation and maintenace requirements or for compliance/enforcement purposes, should be installed and operational for 60 or 90 days prior to the initial NSPS test.

If the above are done, the commenter feels that (1) the owner/operator/agency would be aware of the progress made by the control system in complying with the emission standards, (2) there would be a greater chance of the CEMS passing the performance specification test and of the facility complying with the regulations within the time requirements of § 60.8, and (3) the operator/vendor/tester/agency would minimize loss of valuable resources and time.

2. Once commenter feels that § 60.13(c) should require all CEMS Performance Specification Tests to be done concurrent with NSPS tests under § 60.8. This would streamline the process and save resources for owners and agencies alike.

3. Section 60.13(d) was revised to delete the requirements listed under (d)(1) and (d)(2) because EPA felt that the relative accuracy test would validate the CEMS system which includes the calibration gases or devices. One commenter, however, feels that the requirement to introduce zero and span gas mixtures into the measurement system at the probe at the stack wall should be retained and conducted in such a way that the entire system including the sample interface is checked. This requirement would provide a means to check the CEMS on a daily basis. In addition, the commenter feels that the requirement for checking the calibration gases at 6-month intervals may be deleted provided that the values used for replacement gas cylinders, calibration gas cells or optical filters are approved by the control agency.

4. One commenter feels that the following specifications should be added in Section 4 of Performance Specification 2:

a. The CEMS relative accuracy should be relaxed by using a sliding function of the allowable emission standard and/or the reference method tests for very low emission limits, e.g., 0.10 pounds per 10^6 Btu emission limit under PSD permits.

b. Each new compliance/enforcement CEMS installed after 1983 must have an external means of checking the calibration of the instrument using separate calibration/audit materials.

c. A minimum data recovery specification of at least 18 hours in at least 22 out of 30 days (or similar) should be included. This would mean that a performance specification test would not be officially completed until after the 30 days.

5. One commenter feels that EPA should consider using Section 7.1 of Performance Specification 2 to specify that during the CEMS performance specification test all data be recorded both in separate units of measurements (ppm and percent CO_2 or O_2) as well as combined units of the standard.

6. In Performance Specification 2, the definition of "Relative Accuracy" is incorrect. Instead of a degree of correctness, it is actually a measure of "relative error." One commenter feels that "relative accuracy" should be changed to "relative error."

7. In Section 7.3 of Performance Specification 2, the tester is allowed to reject up to three samples provided that the total number of test results used to determine the relative accuracy is greater than or equal to nine. EPA had considered using statistical techniques to reject outliers, but found that these techniques were too restrictive. One commenter feels that statistical techniques should be used. At a minimum, the commenter feels that the control agencies should be consulted before any data is rejected.

Miscellaneous

Authority: This proposed rule making is issued under the authority of sections 111, 114, and 301(a) of the Clean Air Act as amended (42 U.S.C. 7411, 7414, and 7601(a)).

Dated: January 13, 1981.

Douglas M. Costle,

Administrator.

It is proposed that §§ 60.13, 60.46, and 60.47a, Appendix A, and Appendix B of 40 CFR Part 60 be amended as follows:

1. By revising § 60.13(b), 60.13(c)(2)(ii), and 60.13(d), by removing subparagraphs (1), (2), and (3) of § 60.13(b), and by removing subparagraphs (1), (2), and (3) of § 60.13(d) as follows:

§ 60.13 Monitoring requirements.

* * * * *

(b) All continuous monitoring systems and monitoring devices shall be installed and operational prior to conducting performance tests under § 60.8. Verification of operational status shall, as a minimum, include completion of the manufacturer's written requirements or recommendations for installation, operation, and calibration of the device.

(c) * * *

(2) * * *

(ii) Continuous monitoring systems for measurement of nitrogen oxides or sulfur dioxide shall be capable of measuring emission levels within ±20 percent with a confidence level of 95 percent. The performance tests and calculation procedures set forth in Performance Specification 2 of Appendix B shall be used for demonstrating compliance with this specification.

* * * * *

(d) Owners and operators of all continuous emission monitoring systems installed in accordance with the provisions of this part shall check the zero and span drift at least once daily in accordance with the method prescribed by the manufacturer of such systems unless the manufacturer recommends adjustments at shorter intervals in which case such recommendations shall be followed. The zero and span shall, as a minimum, be adjusted whenever the 24-hour zero drift of 24-hour span drift limits of the applicable performance specifications in Appendix B are exceeded. The amount of excess zero and span drift measured at the 24-hour interval checks shall be quantified and recorded. For continuous monitoring systems measuring opacity of emissions, the optical surfaces exposed to the effluent gases shall be cleaned prior to performing the zero and span drift adjustments except that for systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds 4 percent opacity. Unless otherwise approved by the Administrator, the following procedures shall be followed for continuous monitoring systems measuring opacity of emissions. Minimum procedures shall include a method for producing a simulated zero opacity condition and an upscale(span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of the light beam. Such procedures shall provide a system check of the analyzer internal optical surfaces and all electronic circuitry including the lamp and photodetector assembly.

* * * * *

2. By revising § 60.46(a)(4) as follows:

§ 60.46 Test methods and procedures.

(a) * * *

(4) Method 6 for concentration of SO_2. Method 6A may be used whenever Methods 6 and 3 data are used to determine the SO_2 emission rate in ng/J, and

* * * * *

3. By revising § 60.47a(h)(1) as follows:

§ 60.47a Emission monitoring.

* * * * *

(h) * * *

(1) Reference Methods 3, 6, and 7 as applicable, are used. Method 6B may be used whenever Methods 6 and 3 data are used to determine the SO_2 emission rate in ng/J. The sampling location(s) are the same as those used for the continuous monitoring system.

* * * * *

4. By adding to Appendix A of 40 CFR Part 60 two new methods, Methods 6A and Method 6B, to read as follows:

Appendix A—Reference Test Methods

* * * * *

Method 6A—Determination of Sulfur Dioxide, Moisture, and Carbon Dioxide Emissions from Fossil Fuel Combustion Sources

1. *Applicability and Principle*

1.1 *Applicability.* This method applies to the determination of sulfur dioxide (SO_2) emissions from fossil fuel combustion sources in terms of concentration (mg/m³) and in terms of emission rate (ng/J) and to the determination of carbon dioxide (CO_2) concentration (percent). Moisture, if desired, may also be determined by this method.

The minimum detectable limit, the upper limit, and the interferences of the method for the measurement of SO_2 are the same as for Method 6. For a 20-liter sample, the method has a precision of 0.5 percent CO_2 for concentrations between 2.5 and 25 percent CO_2 and 1.0 percent moisture for moisture concentrations greater than 5 percent.

1.2 *Principle.* The principle of sample collection is the same as for Method 6 except that moisture and CO_2 are collected in addition to SO_2 in the same sampling train. Moisture and CO_2 fractions are determined gravimetrically.

2. *Apparatus*

2.1 *Sampling.* The sampling train is shown in Figure 6A–1; the equipment required is the same as for Method 6, except as specified below:

2.1.1 *Midget Impingers.* Two 30-ml midget impingers with a 1-mm restricted tip.

2.1.2 *Midget Bubbler.* One 30-ml midget bubbler with an unrestricted tip.

2.1.3 CO_2 *Absorber.* One 250-ml Erlenmeyer bubbler with an unrestricted tip, or equivalent.

2.2 *Sample Recovey and Analysis.* The equipment needed for sample recovery and analysis is the same as required for Method 6. In addition, a balance to measure within 0.05 g is needed for analysis.

3. *Reagents*

Unless otherwise indicated, all reagents must conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society. Where such specifications are not available, use the best available grade.

3.1 *Sampling.* The reagents required for sampling are the same as specified in Method 6, except that 80 percent isopropanol and 10 percent potassium iodide solutions are not required. In addition, the following reagents are required:

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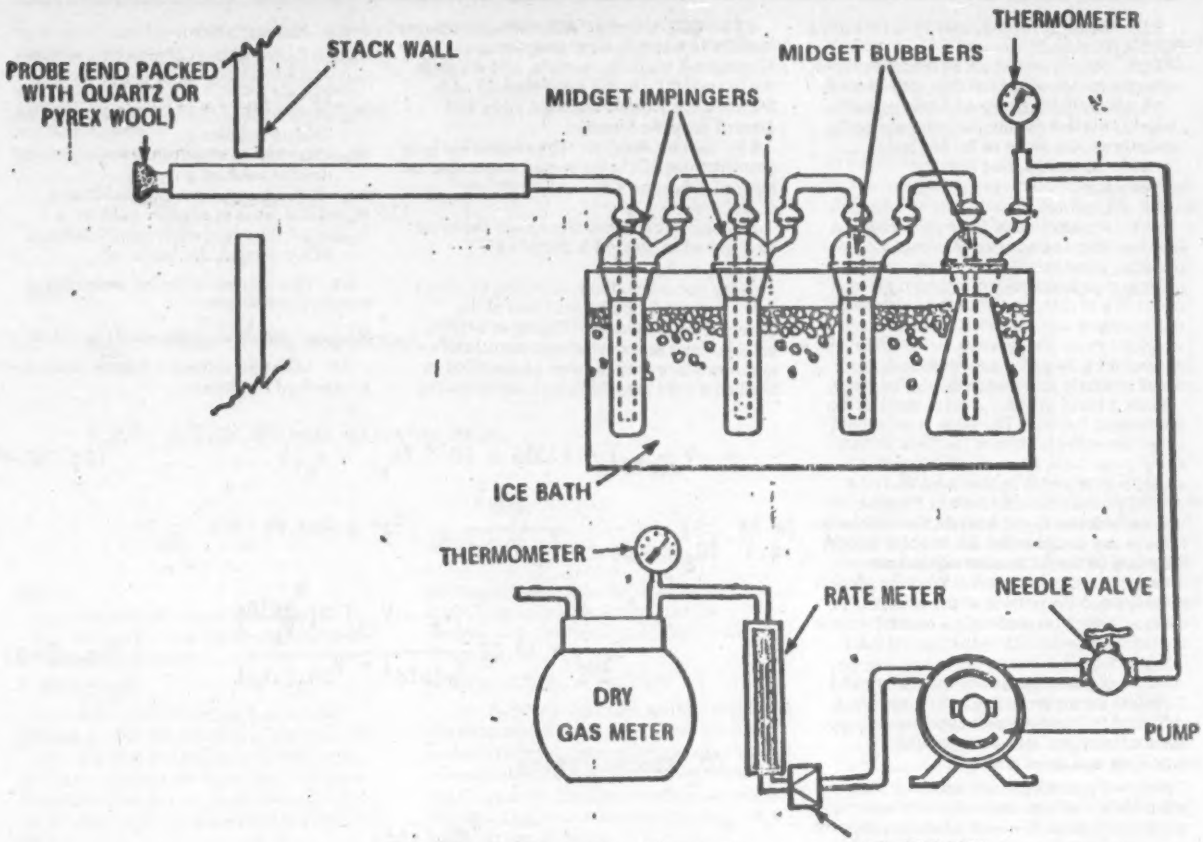

Figure 6A-1. Sampling train.

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3.1.1 *Drierite.*[*] Anhydrous calcium sulfate ($CaSO_4$) desiccant, 8 mesh.

3.1.2. *Ascarite.* Sodium hydroxide coated asbestos for absorption of CO_2, 8 to 20 mesh.

3.2 *Sample Recovery and Analysis.* The reagents needed for sample recovery and analysis are the same as for Method 6, Sections 3.2 and 3.3, respectively.

4. *Procedure*

4.1 *Sampling*

4.1.1 *Preparation of Collection Train.* Measure 15 ml of 3 percent hydrogen peroxide into each of the first two midget impingers. Into the midget bubbler, place about 25 g of drierite. Clean the outsides of the impingers and the drierite bubbler and weigh (at room temperature, ~ 20° C) to the nearest 0.1 g. Weigh the three vessels simultaneously and record this initial mass.

Place a small amount of glass wool in the Erlenmeyer bubbler. The glass wool should cover the entire bottom of the flask and be about 1-cm thick. Place about 100 g of ascarite on top of the glass wool and carefully insert the bubbler top. Plug the bubbler exhaust leg and invert the bubbler to remove any ascarite fom the bubbler tube. A wire may be useful in assuring that no ascarite remains in the tube. With the plug removed and the outside of the bubbler cleaned, weigh (at room temperature, ~ 20° C), to the nearest 0.1 g. Record this initial mass.

Assemble the train as shown in Figure 6A–1. Adjust the probe heater to a temperature sufficient to prevent water condensation. Place crushed ice and water around the impingers and bubblers.

Note.—For stack gas streams with high particulate loadings, an in-stack or heated out-of-stack glass fiber mat filter may be used in place of the glass wool plug in the probe.

4.1.2 *Leak-Check Procedure and Sample Collection.* The leak-check procedure and sample collection procedure are the same as specified in Method 6, Sections 4.1.2 and 4.1.3, respectively.

4.2 *Sample Recovery.*

4.2.1 *Moisture Measurement.* Disconnect the peroxide impingers and the drierite bubbler from the sample train. Allow time (about 10 minutes) for them to reach room temperature, clean the outsides and then weigh them simultaneously in the same manner as in Section 4.1.1. Record this final mass.

4.2.2 *Peroxide Solution.* Pour the contents of the midget impingers into a leak-free polyethylene bottle for shipping. Rinse the two midget impingers and connecting tubes with deionized distilled water, and add the washings to the same storage container.

[*]Mention of trade names or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.

4.2.3 CO_2 *Absorber.* Allow the Erlenmeyer bubbler to warm to room temperature (about 10 minutes), clean the outside, and weigh to the nearest 0.1 g in the same manner as in Section 4.1.1. Record this final mass and discard the used ascarite.

4.3 *Sample Analysis.* The sample analysis procedure for SO_2 is the same as specified in Method 6, Section 4.3.

5. *Calibration*

The calibrations and checks are the same as required in Method 6, Section 5.

6. *Calculations*

Carry out calculations, retaining at least 1 extra decimal figure beyond that of the acquired data. Round off figures after final calculation. The calculation nomenclature and procedure are the same as specified in Method 6 with the addition of the following:

6.1 Nomenclature.

C_{H_2O} = Concentration of moisture, percent.

co_2 = Concentration of CO_2, dry basis, percent.

m_{wi} = Initial mass of peroxide impingers and drierite bubbler, g.

m_{wf} = Final mass of peroxide impingers and drierite bubbler, g.

m_{ai} = Initial mass of ascarite bubbler, g.

m_{af} = Final mass of ascarite bubbler, g.

$V_{co_2(std)}$ = Standard equivalent volume of CO_2 collected, dry basis, m^3.

6.2 CO_2 volume collected, corrected to standard conditions.

$$V_{co_2(std)} = 5.467 \times 0^{-4}(m_{af} - m_{ai}) \quad \text{(Eq. 6A-1)}$$

6.3 Moisture volume collected, corrected to standard conditions.

$$V_{w(std)} = 1.336 \times 10^{-3} (m_{wf} - m_{wi}) \quad \text{(Eq. 6A-2)}$$

6.4 SO_2 concentration.

$$C_{SO_2} = 32.03 \frac{(V_t - V_{tb})\, N\left(\frac{V_{soln}}{V_a}\right)}{V_{m(std)} + V_{CO_2(std)}} \quad \text{(Eq. 6A-3)}$$

6.5 CO_2 concentration.

$$C_{CO_2} = \frac{V_{CO_2(std)}}{V_{m(std)} + V_{CO_2(std)}} \times 100 \quad \text{(Eq. 6A-4)}$$

6.6 Moisture concentration.

$$C_{H_2O} = \frac{V_{H_2O(std)}}{V_{m(std)} + V_{H_2O(std)} + V_{CO_2(std)}} \quad \text{(Eq. 6A-5)}$$

7. *Emission Rate Procedure*

If the only emission measurement desired is in terms of emission rate of SO_2 (ng/J), an abbreviated procedure may be used. The differences between Method 6A and the abbreviated procedure are described below.

7.1 *Sample Train.* The sample train is the same as shown in Figure 6A–1 and as described in Section 4, except that the dry gas meter is not needed.

7.2 *Preparation of the collection train.* Follow the same procedure as in Section 4.1.1, except that the peroxide impingers and drierite bubbler need not be weighed before or after the test run.

7.3 *Sampling.* Operate the train as described in Section 4.1.3, except that dry gas

meter readings, barometric pressure, and dry gas meter temperatures need not be recorded.

7.4 *Sample Recovery.* Follow the procedure in Section 4.2, except that the peroxide impingers and drierite bubbler need not be weighed.

7.5 *Sample Analysis.* Analysis of the peroxide solution is the same as described in Section 4.3.

7.6 Calculations.

7.6.1 SO_2 mass collected.

$$m_{SO_2} = 32.03\ (V_t - V_{tb})\ N\left(\frac{V_{soln}}{V_a}\right) \qquad \text{(Eq. 6A-7)}$$

Where:

m_{SO_2} = Mass of SO_2 collected, mg.

7.6.2 Sulfur dioxide emission rate.

$$E_{SO_2} = F_c\ (1.829 \times 10^9)\ \frac{m_{SO_2}}{(m_{af} - m_{ai})} \qquad \text{(Eq. 6A-8)}$$

Where:

$E_{so}\mu$ = Emission rate of SO_2, ng/J.

F_c = Carbon F factor for the fuel burned, m^3/J, from Method 19.

8. *Bibliography*

8.1 Same as for Method 6, citations 1 through 8, with the addition of the following:

8.2 Stanley, Jon and P.R. Westlin. An Alternate Method for Stack Gas Moisture Determination. Source Evaluation Society Newsletter. *Volume 3, Number 4.* November 1978.

8.3 Whittle, Richard N. and P.R. Westlin. Air Pollution Test Report: Development and Evaluation of an Intermittent Integrated SO_2/CO_2 Emission Sampling Procedure. Environmental Protection Agency, Emission Standard and Engineering Division, Emission Measurement Branch. Research Triangle Park, North Carolina. December 1979. 14 pages.

Method 6B—Determination of Sulfur Dioxide and Carbon Dioxide Daily Average Emissions From Fossil Fuel Combustion Sources

1. *Applicability and Principle*

1.1 Applicability. This method applies to the determination of sulfur dioxide (SO_2) emissions form combustion sources in terms of concentration (mg/M^3) and emission rate (ng/J), and for the determination of carbon dioxide (CO_2) concentration (percent) on a daily (24 hours) basis.

The minimum detectable limit, upper limit, and the interferences for SO_2 measurements are the same as for Method 6. For a 20-liter sample, the method has a precision of 0.5 percent CO_2 for concentrations between 2.5 and 25 percent CO_2.

1.2 Principle. A gas sample is extracted from the sampling point in the stack intermittently over a 24-hour or other specified time period. Sampling may also be conducted continuously if the apparatus and procedure are modified (see the note in Section 4.1.1). The SO_2 and CO_2 are separated and collected in the sampling train. The SO_2 fraction is measured by the barium-thorin titration method and CO_2 is determined gravimetrically.

2. *Apparatus*

The equipment required for this method is the same as specified for Method 6A, Section 2, with the addition of an industrial timer-switch designed to operate in the "on" position from 3 to 5 continuous minutes and "off" the remaining period over a repeating, 2-hour cycle.

3. *Reagents*

All reagents for sampling and analysis are the same as described in Method 6A, Section 3.

4. *Procedure*

4.1 *Sampling*

4.1.1 *Preparation of Collection Train.* Preparation of the sample train is the same as described in Method 6A, Section 4.1.4 with the addition of the following:

Assemble the train as shown in Figure 6B-1. The probe must be heated to a temperature sufficient to prevent water condensation and must include a filter (either in-stack, out-of-stack, or both) to prevent particulate entrainment in the perioxide impingers. The electric supply for the probe heat should be continuous and separate from the timed operation of the sample pump.

Adjust the timer-switch to operate in the "on" position form 2 to 4 minutes on a 2-hour repeating cycle. Other timer sequences may be used provided there are at least 12 equal, evenly spaced periods of operation over 24 hours and the total sample volume is between 20 and 40 liters for the amounts of sampling reagents prescribed in this method.

Add cold water to the tank until the impingers and bubblers are covered at least two-thirds of their length. The impingers and bubbler tank must be covered and protected from intense heat and direct sunlight. If freezing conditions exist, the impinger solution and the water bath must be protected.

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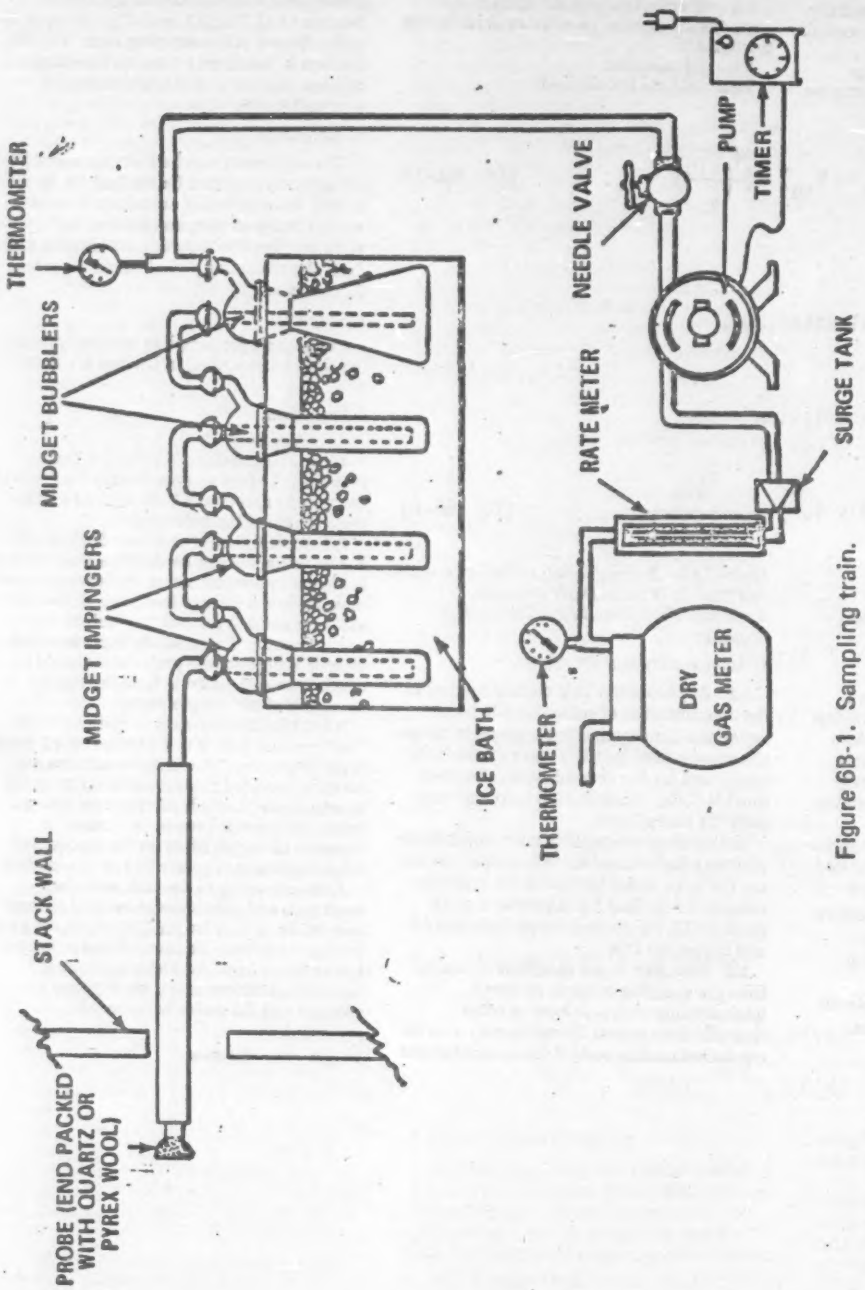

Figure 6B-1. Sampling train.

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. Note.—Sampling may be conducted continuously if a low flow-rate sample pump (>24ml/min) is used. Then the timer-switch is not necessary. In addition, if the sample pump is designed for constant rate sampling, the rate meter may be deleted. The total gas volume collected should be between 20 and 40 liters for the amounts of sampling reagents prescribed in this method.

4.1.2 *Leak-Check Procedure.* The leak-check procedure is the same as describedf in Method 6, Section 4.1.2.

4.1.3 *Sample Collection.* Record the initial dry gas meter reading. To begin sampling, position the tip of the probe at the sampling point, connect the probe to the first impinger (or filter), and start the timer and the sample pump. Adjust the sample flow to a constant rate of approximately 1.0 liter/min as indicated by the rotameter. Assure that the timer is operating as intended, i.e., in the "on" position 3 to 5 minutes at 2-hour intervals, or other time interval specified.

During the 24-hour sampling period, record the dry gas meter temperature between 9:00 a.m. and 11:00 a.m., and the barometric pressure.

At the conclusion of the run, turn off the timer and the sample pump, remove the probe from the stack, and record the final gas meter volume reading. Conduct a leak check as described in Section 4.1.2. If a leak is found, void the test run or use procedures acceptable to the Administrator to adjust the sample volume for leakage. Repeat the steps in this Section (4.1.3) for successive runs.

4.2 *Sample Recovery.* The procedures for sample recovery (moisture measurement, peroxide solution, and ascarite bubbler) are the same as in Method 6A, Section 4.2.

4.3 *Sample Analysis.* Analysis of the peroxide impinger solutions is the same as in Method 6, Section 4.3.

5. *Calibration*

5.1 *Metering System.*

5.1.1 *Initial Calibration.* The initial calibration for the volume metering system is the same as for Method 6, Section 5.1.1.

5.1.2 *Periodic Calibration Check.* After 30 days of operation of the test train conduct a calibration check as in Section 5.1.1 above, except for the following variations: (1) The leak check is not be conducted, (2) three or more revolutions of the dry gas meter may be used, and (3) only two independent runs need be made. If the calibration factor does not deviate by more than 5 percent from the initial calibration factor determined in Section 5.1.1, then the dry gas meter volumes obtained during the test series are acceptable and use of the train can continue. If the calibration factor deviates by more than 5 percent, recalibrate the metering system as in Section 5.1.1; and for the calculations for the preceding 30 days of data, use the calibration factor (initial or recalibration) that yields the lower gas volume for each test run. Use the latest calibration factor for succeeding tests.

5.2 *Thermometers.* Calibrate against mercury-in-glass thermometers initially and at 30-day intervals.

5.3 *Rotameter.* The rotameter need not be calibrated, but should be cleaned and maintained according to the manufacturer's instruction.

5.4 *Barometer.* Calibrate against a mercury barometer initially and at 30-day intervals.

5.5 *Barium Perchlorate Solution.* Standardize the barium perchlorate solution against 25 ml of standard sulfuric acid to which 100 ml of 100 percent isopropanal has been added.

6. *Calculations*

The nomenclature and calculation procedures are the same as in Method 6A with the following exceptions:

P_{bar} = Initial barometric pressure for the test period, mm Hg.

T_m = Absolute meter temperature for the test period, °K.

7. *Emission Rate Procedure*

The emission rate procedure is the same as described in Method 6A, Section 7, except that the timer is needed and is operated as described in this method.

8. *Bibliography*

The bibliography is the same as described in Method 6A, Section 8.

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5. By revising Performance 2 and Performance 3 of Appendix B of 40 CFR Part 60 to read as follows:

Appendix B—Performance Specifications

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Performance Specification 2—Specifications and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources

1. *Applicability and Principle*

1.1 *Applicability.* This specification is to be used for evaluating the acceptability of SO_2 and NO_x continuous emission monitoring systems (CEMS) after the initial installation and whenever specified in an applicable subpart of the regulations. The CEMS may include, for certain stationary sources, diluent (O_2 or CO_2) monitors.

1.2 *Principle.* Installation and measurement location specifications, performance and equipment specifications, test procedures, and data reduction procedures are included in this specification. Reference method (RM) tests and calibration drift tests are conducted to determine conformance of the CEMS with the specification.

2. *Definitions*

2.1 *Continuous Emission Monitoring System (CEMS).* The total equipment required for the determination of a gas concentration or emission rate. The system consists of the following major subsystems:

2.1.1 *Sample Interface.* That portion of the CEMS that is used for one or more of the following: Sample acquisition, sample transportation, and sample conditioning, or protection of the monitor from the effects of the stack effluent.

2.1.2 *Pollutant Analyzer.* That portion of the CEMS that senses the pollutant gas and generates an output that is proportional to the gas concentration.

2.1.3 *Diluent Analyzer (if applicable).* That portion of the CEMS that senses the diluent gas (e.g., CO_2 or O_2) and generates an output that is proportional to the gas concentration.

2.1.4 *Data Recorder.* That portion of the CEMS that provides a permanent record of the analyzer output. The data recorder may include automatic data reduction capabilities.

2.2 *Point CEMS.* A CEMS that measures the gas concentration either at a single point or along a path that is equal to or less than 10 percent of the equivalent diameter of the stack or duct cross section.

2.3 *Path CEMS.* A CEMS that mesures the gas concentration along a path that is greater than 10 percent of the equivalent diameter of the stack or duct cross section.

2.4 *Span Value.* The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable subpart of the regulations.

2.5 *Relative Accuracy. (RA).* The absolute mean difference between the gas concentration or emission rate determined by the CEMS and the value determined by the reference method(s) plus the 2.5 percent error confidence coefficient of a series of tests divided by the mean of the reference method (RM) tests or the applicable emission limit.

2.6 *Calibration Drift (CD).* The difference in the CEMS output readings from the established reference value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.7 *Centroidal Area.* A concentric area that is geometrically similar to the stack or duct cross section and is no greater than 1 percent of the stack or duct cross-sectional area.

2.8 *Representative Results.* As defined by the RM test procedure outlined in this specification.

3. *Installation and Measurement Location Specifications*

3.1 *CEMS Installation and Measurement Location.* Install the CEMS at an accessible location where the pollutant concentration or emission rate measurements are directly representative or can be corrected so as to be representative of the total emissions from the affected facility. Then select representative measurement points or paths for monitoring such that the CEMS will pass the relative accuracy (RA) test (see Section 7). If the cause of failure to meet the RA test is determined to be the measurement location, the CEMS may be required to be relocated.

Suggested measurement locations and points or paths are listed below; other locations and points or paths may be less likely to provide data that will meet the RA requirements.

3.1.1 *CEMS Location.* It is suggested that the measurement location be at least two equivalent diameters downstream from the nearest control device or other point at which a change in the pollutant concentration or emission rate may occur and at least a half equivalent diameter upstream from the effluent exhaust.

3.1.2 *Point CEMS.* It is suggested that the measurement point be (1) no less than 1.0 meter from the stack or duct wall, or (2) within or centrally located over the centroidal area of the stack or duct cross section.

3.1.3 *Path CEMS.* It is suggested that the effective measurement path (1) be totally within the inner area bounded by a line 1.0 meter from the stack or duct wall, or (2) have at least 70 percent of the path within the inner 50 percent of the stack or duct cross-sectional area, or (3) be centrally located over any part of the centroidal area.

3.2 *RM Measurement Location and Traverse Points.* Select an RM measurement point that is accessible and at least two equivalent diameters downstream from the nearest control device or other point at which a change in the pollutant concentration or emission rate may occur and at least a half equivalent diameter upstream from the effluent exhaust. The CEMS and RM locations need not be the same.

Then select traverse points that assure acquisition of representative samples over the stack or duct cross section. The minimum requirements are as follows: Establish a "measurement line" that passes through the centroidal area. If this line interferes with the CEMS measurements, displace the line up to 30 cm (or 5 percent of the equivalent diameter of the cross section, whichever is less) from the centroidal area. Locate three traverse points at 16.7, 50.0, and 83.3 percent of the measurement line. If the measurement line is longer than 2.4 meters, the three traverse points may be located on the line at 0.4, 1.2, and 2.0 meters from the stack or duct wall. The tester may select other traverse points, provided that they can be shown to the satisfaction of the Administrator to provide a representative sample over the stack or duct cross section. Conduct all necessary RM tests within 3 cm (but no less than 3 cm from the stack or duct wall) of the traverse points.

4. *Performance and Equipment Specifications*

4.1 *Instrument Zero and Span.* The CEMS recorder span must be set at 90 to 100 percent of recorder full-scale using a span level of 90 to 100 percent of the span value (the Administrator may approve other span levels). The CEMS design must also allow the determination of calibration drift at the zero and span level points on the calibration curve. If this is not possible or is impractical, the design must allow these determinations to be conducted at a low-level (0 to 50 percent of span value) point and at a high-level (80 to 100 percent of span value) point. In special cases, if not already approved, the Administrator may approve a single-point calibration-drift determination.

4.2 *Calibration Drift.* The CEMS calibration must not drift or deviate from the reference value of the gas cylinder, gas cell, or optical filter by more than 2.5 percent of the span value. If the CEMS includes pollutant and diluent monitors, the calibration drift must be determined separately for each in terms of concentrations (see Performance Specification 3 for the diluent specifications).

4.3 *CEMS Relative Accuracy.* The RA of the CEMS must be no greater than 20 percent of the mean value of the RM test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater.

5. *Performance Specification Test Procedure*

5.1 *Pretest Preparation.* Install the CEMS and prepare the RM test site according to the specifications in Section 3, and prepare the CEMS for operation according to the manufacturer's written instructions.

5.2 *Calibration Drift Test Period.* While the affected facility is operating at more than 50 percent capacity, or as specified in an applicable subpart, determine the magnitude of the calibration drift (CD) once each day (at 24-hour intervals) for 7 consecutive days according to the procedure given in Section 6. To meet the requirement of Section 4.2, none of the CD's must exceed the specification.

5.3 *RA Test Period.* Only after the CEMS passes the CD test, conduct the RA test according to the procedure given in Section 7 while the affected facility is operating at more than 50 percent capacity, or as specified in an applicable subpart. To meet the specifications, the RA must be equal to or less than 20 percent or 10 percent of the applicable standard, whichever is greater. For instruments that use common components to measure more than one effluent gas constituent, all channels must simultaneously pass the RA requirement, unless it can be demonstrated that any adjustments made to one channel did not affect the others.

6. *CEMS Calibration Drift Test Procedure*

The CD measurement is to verify the ability of the CEMS to conform to the established CEMS calibration used for determining the emission concentration or emission rate. Therefore, if periodic automatic or manual adjustments are made to the CEMS zero and/or calibration settings, conduct the CD test immediately before these adjustments.

Conduct the CD test at the two points specified in Section 4.1. Introduce to the CEMS the reference gases, gas cells, or optical filters (these need not be certified). Record the CEMS response and subtract this value from the reference value (see example data sheet in Figure 2–1).

If an increment addition procedure is used to calibrate the CEMS, a single-point CD test may be used as follows: Use an increment cell or calibration gas ith a value that will provide a total CEMS response (i.e., stack plus cell concentrations) between 80 and 95 percent of the span value. Compare the difference between the measured CEMS response and the expected CEMS response with the increment value to establish the CD.

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	Day	Date and time	Calibration value	Monitor value	Difference
Low-level					
High-level					

Figure 2-1. Calibration drift determination.

BILLING CODE 6560-26-C

Relative Accuracy Test Procedure

7.1 *Sampling Strategy for RM Tests.* Conduct the RM tests such that they will yield results representative of the emissions from the source and can be correlated to the CEMS data. Although it is preferable to conduct the diluent (if applicable), moisture (if needed), and pollutant measurements simultaneously, the diluent and moisture measurements that are taken within a 30- to 60-minute period, which includes the pollutant measurements, may be used to calculate dry pollutant concentration and emission rate.

In order to correlate the CEMS and RM data properly, mark the beginning and end of each RM test period of each run (including the exact time of the day) on the CEMS chart recordings or other permanent record of output. Use the following strategies for the RM tests:

7.1.1 For integrated samples, e.g., Method 6 and Method 4, make a sample traverse of at least 21 minutes, sampling for 7 minutes at each traverse point.

7.1.2 For grab samples, e.g., Method 7, take one sample at each traverse point, scheduling the grab samples so that they are taken simultaneously (within a 3-minute period) or are an equal interval of time apart over a 21-minute (or less) period.

Note.—At times, CEMS RA tests are conducted during NSPS performance tests. In these cases, RM results obtained during CEMS RA tests may be used to determine compliance as long as the source and test conditions are consistent with the applicable regulations.

7.2 *Correlation of RM and CEMS Data.* Correlate the CEMS and the RM test data as to the time and duration by first determining from the CEMS final output (the one used for reporting) the integrated average pollutant concentration or emission rate for each pollutant RM test period. Consider system response time, if important, and confirm that the pair of results are on a consistent moisture, temperature, and diluent concentration basis. Then, compare each integrated CEMS value against the corresponding average RM value. Use the following guidelines to make these comparisons.

7.2.1 If the RM has an integrated sampling technique, make a direct comparison of the RM results and CEMS integrated average value.

7.2.2 If the RM has a grab sampling technique, first average the results from all grab samples taken during the test run and then compare this average value against the integrated value obtained from the CEMS chart recording during the run.

7.3 *Number of RM Tests.* Conduct a minimum of nine sets of all necessary RM tests. For grab samples, e.g., Method 7, a set is made up of at least three separate measurements. Conduct each set within a period of 30 to 60 minutes.

Note.—The tester may choose to perform more than nine sets of RM tests. If this option is chosen, the tester may, at his descretion, reject a maximum of three sets of the test results so long as the total number of test results used to determine the relative accuracy is greater than or equal to nine, but he must report all data including the rejected data.

7.4 *Reference Methods.* Unless otherwise specified in an applicable subpart of the regulations, Methods 6, 7, 3, and 4, or their approved alternatives, are the reference methods for SO_2, NO_x, diluent (O_2 or CO_2), and moisture, respectively.

7.5 *Calculations.* Summarize the results on a data sheet; an example is shown in Figure 2–2. Calculate the mean of the RM values. Calculate the arithmetic differences between the RM and the CEMS output sets. Then calculate the mean of the difference, standard deviation, confidence coefficient, and CEMS RA, using Equations 2–1, 2–2, 2–3, and 2–4.

8. *Equations*

8.1 *Arithmetic Mean.* Calculate the arithmetic mean of the difference, d, of a data set as follows:

$$\bar{d} = \frac{1}{n} \sum_{i=1}^{n} d_i \qquad \text{(Eq. 2-1)}$$

Where:

n = Number of data points.

$\sum_{i=1}^{n} d_i$ = Algebraic sum of the individual differences, d_i.

When the mean of the differences of pairs of data is calculated, be sure to correct the data for moisture, if applicable.

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Run No.	Date and time	SO_2			NO_x[b]			CO_2 or O_2[a]		SO_2[a]			NO_x[a]		
		RM	M	Diff	RM	M	Diff	RM	M	RM	M	Diff	RM	M	Diff
		ppm[c]			ppm[c]			%[d]	%[d]	mass/GCV			mass/GCV		
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
Average															
Confidence Interval															
Accuracy[c]															

[a]For steam generators; [b] Average of three samples; [c] Make sure that RM and M data are on a consistent basis, either wet or dry.

Figure 2-2. Relative accuracy determination.

BILLING CODE 6560-26-C

8.2 *Standard Deviation.* Calculate the standard deviation S_d as follows:

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} d_i^2 - \frac{\left(\sum_{i=1}^{n} d_i\right)^2}{n}}{n-1}} \qquad \text{(Eq. 2-2)}$$

8.3 *Confidence Coefficient.* Calculate the 2.5 percent error confidence coefficient (one-tailed) CC as follows:

$$CC = t_{0.975}\frac{S_d}{\sqrt{n}} \qquad \text{(Eq. 2-3)}$$

Where:

$t_{0.975}$ = t-values (see Table 2-1)

Table 2-1. t-VALUES

n*	$t_{0.975}$	n*	$t_{0.975}$	n*	$t_{0.975}$
2	12.706	7	2.447	12	2.201
3	4.303	8	2.365	13	2.179
4	3.182	9	2.306	14	2.160
5	2.776	10	2.262	15	2.145
6	2.571	11	2.228	16	2.131

* The values in this table are already corrected for n-1 degrees of freedom. Use n equal to the number of individual values.

8.4 *Relative Accuracy.* Calculate the RA of a set of data as follows:

$$RA = \frac{|\bar{d}| + |CC|}{\overline{RM}} \times 100 \qquad \text{(Eq. 2-4)}$$

Where:

$|\bar{d}|$ = Absolute value of the mean of differences (from Equation 2-1).

$|CC|$ = Absolute value of the confidence coefficient (from Equation 2-3).

$\overline{RM}$ = Average RM value or applicable standard.

9. *Reporting*

At a minimum (check with the appropriate regional office, or State or local agency for additional requirements, if any) summarize in tabular form the calibration drift tests and the RA tests. Include all data sheets, calculations, and charts (record of data outputs) that are necessary to substantiate that the performance CEMS met the performance specification.

10. *Bibliography*

10.1 "Experimental Statistics," Department of Commerce, Handbook 91, 1963, pp. 3–31, paragraphs 3–3.1.4.

Performance Specification 3—Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources

1. *Applicability and Principle*

1.1 *Applicability.* This specification is to be used for evaluating the acceptability of O_2 and CO_2 continuous emission monitoring systems (CEMS) after initial installation and whenever specified in an applicable subpart of the regulations. The specification applies to O_2 and CO_2 monitors that are not included under Performance Specification 2.

The definitions, installation measurement location specifications, test procedures, data reduction procedures, reporting requirements, and bibliography are the same as in Performance Specification 2, Sections 2, 3, 5, 6, 8, 9, and 10, and also apply to O_2 and CO_2 CEMS under this specification. The performance and equipment specifications and the relative accuracy (RA) test procedures for O_2 and CO_2 CEMS differ from SO_2 and NO_x CEMS, unless otherwise noted, and are therefore included here.

1.2 *Principle.* Reference method (RM) tests and calibration drift tests are conducted to determine conformance of the CEMS with the specification.

2. *Performance and Equipment Specifications*

2.1 *Instrument Zero and Span.* This specification is the same as Section 4.1 of Performance Specification 2.

2.2 *Calibration Drift.* The CEMS calibration must not drift by more than 0.5 percent O_2 or CO_2 from the reference value of the gas, gas cell, or optical filter.

2.3 *CEMS Relative Accuracy.* The RA of the CEMS must be no greater than 20 percent of the mean value of the RM test data or 1.0 percent O_2 or CO_2, whichever is greater.

3. *Relative Accuracy Test Procedure*

3.1 *Sampling Strategy for RM Tests, correlation of RM and CEMS data, Number of RM Tests, and Calculations.* This is the same as Performance Specification 2, Sections 7.1, 7.2, 7.3, and 7.5, respectively.

3.2 *Reference Method.* Unless otherwise specified in an applicable subpart of the regulations, Method 3 of Appendix A or any approved alternative is the reference method for O_2 or CO_2.

(Sec. 114, Clean Air Act, as amended (42 U.S.C. 7414))

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